

Management of Coconut Garden during Rainy Season

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Timely adoption of crop management practices especially soil health management and prophylactic/curative plant protection measures is very important to ensure sustainable coconut production. Diseases like bud rot and leaf rot affecting coconut are more prevalent during monsoon. Hence, timely adoption of prophylactic/curative measures is very important to avoid spread of these diseases during rainy season. Similarly, appropriate prophylactic/curative measures are to be adopted in rainy season for the effective management of pests like rhinoceros beetle, red palm weevil, root grubs and eriophid mite to avoid crop loss in coconut.

Planting of coconut seedlings

In well drained soils, seedlings can be transplanted with the onset of southwest monsoon in the west coast region. If the land is uneven and full of shrubs, the shrubs have to be cleared and land levelled before taking pits. In laterite soil with rocky substratum,

deeper and wider pits, 1.5 m x 1.5 m x 1.0 m may be dug and filled up with loose soil, powdered cow dung and ash up to a depth of 60 cm before planting. In loamy soils with low water table, planting in pit size of 1 m x 1 m x 1 m filled with top soil to height of 50 cm is generally recommended. However, when the water table is high, planting at the surface or even on mounds may be necessary. Two layers of coconut husk (with concave surface facing up) can be arranged at the bottom of the pit before filling up. This will help in conserving the moisture. In case of laterite soil, addition of 2 kg of common salt will help in loosening the soil.

For realizing better yield from coconut, optimum plant density must be maintained in the field. A spacing of 7.5 m x 7.5 m is generally recommended for coconut. This will accommodate 177 palms per ha under the square system of planting. If the triangular system is adopted, an additional 20 to 25 palms can be planted. Hedge system can also be adopted giving

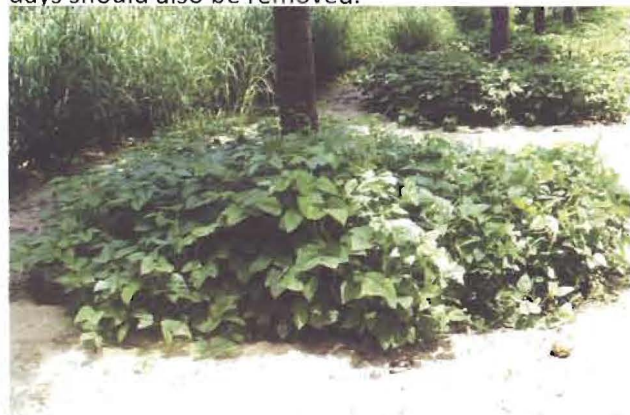


a spacing of 5.0 to 5.5 m along the rows and 9 to 10 m between rows.

Generally underplanting is done in coconut gardens where the palms become unproductive and uneconomic to the farmer. Old palms are removed in stages over a period of 3 to 4 years. First peg mark the area to be underplanted. To start with underplanting, remove the very poor yielders (less than 10 nuts per palm per year) and those trees which are very close to the peg marked point for underplanting. Other trees are to be removed at the rate of one third each year during 2nd, 3rd and 4th year after starting underplanting. If the existing garden is irregularly spaced, remove old palms within 1 m radial distance from the newly planted seedlings in the first year of underplanting, 2 m distance in second year, 3 m distance in third year and the rest in 4th year.

Care of young palms

In areas subjected to water logging, care should be taken to provide drainage facility in the coconut garden during rainy season. The pits should be cleared of weeds periodically. Soil washed down and covering the collar of the seedlings during the rainy days should also be removed.



Green manuring

Cultivation of green manure legumes having symbiotic association with efficient Rhizobium strains in coconut basins and interspaces during the monsoon period is a simple agrotechnique that can be adopted to generate significant quantity of biomass which can be incorporated to the palms at their maximum vegetative growth. If it is homestead type of coconut farming with other inter/mixed crops in the interspace, basin management with green manure legumes can be adopted. Under monocropping, interspace can also be utilised for sowing green manure legumes. At the onset of

monsoon, seeds of green manure legumes are to be sown @ 100 g per basin for basin management and the seed rate will be 25 kg per ha of coconut garden if interspace also can be utilised for generating green manure. Green manure leguminous species like cow pea, sunhemp, daincha, horse gram etc are suitable for this purpose. The field experiments on basin management with legumes in adult coconut plantations revealed the effectiveness of this technique to substitute fertilizer nitrogen for coconut upto 30 per cent.

Growing Glyricidia as green manure crop

Substantial quantity of nitrogen rich biomass can be produced through the cultivation of the fast growing perennial leguminous green leaf manure tree crop, Glyricidia in the coconut plantations. This can be very well grown along the borders of coconut plantation and can generate adequate amount of nitrogen rich green leaves. It can also be raised in littoral sandy soils where no other green manure can be established. The tree is propagated either through vegetative cuttings or seeds. One meter long stem cuttings or 3 to 4 month old seedlings raised in poly bags/raised beds can be used for planting. It is preferable that the planting season coincides with the monsoon (South West / North East monsoon) for better establishment. Spacing of 1 m x 1 m can be adopted. Two rows of glyricidia can be planted along the boundary of coconut garden in a zig zag manner. Plant stem cuttings or seedlings in an upright position in pits of 30 cm³. Height of the plants should always be maintained at 1 m by pruning.

Vermicomposting of coconut leaves

Rainy season is ideal for the production of vermicompost using coconut leaves. Fallen coconut leaves in coconut garden can be effectively converted into rich vermicompost using the earth worm, Eudrilus spp. Vermicompost preparation can be done in cement tanks or in trenches made in the coconut garden. The weathered coconut leaves collected from the garden should be kept for two weeks after sprinkling with cowdung slurry. Cowdung should be used at the rate of one tenth of the weight of the leaves. Afterwards earth worms (Eudrilus sp.) are to be introduced at the rate of one kg for one tonne of the material. Vermicompost will be ready in about 75 to 90 days.

Application of bio fertilizers

Application of phosphate solubilising

biofertilizers to coconut palms is highly beneficial when the available phosphorus content in the soil is low. CPCRI has released a product 'Keraprobio' which is a Plant Growth Promoting Rhizobacteria (PGPR) *Bacillus megaterium* which is also having the phosphate solubilising property. Kera probio can be applied @100 g/palm along with application of organic manures at the fag end of monsoon during August –September.



Fertilizer application

Soil related constraints, especially soil acidity and deficiency/imbalance of nutrients including major, secondary and micronutrients adversely affect coconut production. Hence, it is always advisable to test soil in the coconut garden periodically based on the results of which type and dosage of fertilizers and soil amendments should be decided. From an existing coconut garden soil sample should be taken from the basin of the palm 1 m away from the trunk. Under rainfed situation it is recommended to apply the chemical fertilizers in two splits. In the west coast region, apply one third quantity of recommended fertilizers as the first split after the receipt of summer showers during May and the remaining two-third quantity as second split dose during August-September after the cessation of heavy rains. First split dose ie one third of the recommended dose of fertilizers can be spread around the palms within a radius of 1.8 m in the coconut basin. For correcting soil acidity lime or dolomite can be applied. General recommendation is 1kg lime or dolomite per coconut tree which is to be applied two weeks before the application of chemical fertilizers.

Soil and water conservation measures

Proper soil and moisture conservation practices are essential for ensuring sustainable production especially when coconut is grown under rainfed condition with undulating terrain and sloppy conditions.

Husk burial

Burial of husk in trenches in between the rows of palms is also effective for moisture conservation in coconut gardens. Husk burial is to be done at the beginning of the monsoon in linear trenches of 1.5 to 2 m wide and about 0.3 to 0.5 m deep between rows of palms with concave side of husk facing upwards and each layer is to be covered with soil.

Mulching

Mulching is an important practice for moisture conservation. The coconut basins can be mulched with coir dust, coconut husks, green leaves, dried leaves, organic wastes, and dried coconut leaves. Mulching should be done before the end of north east monsoon and before the top soil dries up.

Catch pit filled with coconut husk

Catch pits can be constructed at all slopes to conserve soil and water. Though there are no standard dimensions for catch pits, catch pits of 1.5 m length x 0.5 m width x 0.5 m depth can be constructed. A bund is to be made at the downside using the excavated soil and pineapple suckers planted on it. This pit is also filled with coconut husk.

Contour trench filled with coconut husk

This measure is to be taken up where the land slope is high. Trenches of 50 cm width x 50 cm depth and convenient length are to be made in between two rows of coconut palms. These trenches would then be filled with coconut husk. Coconut husks need to be filled in layers with the bottom layers facing up and top layer facing down. A bund of 20 cm height and suitable width (>50 cm) is made at the downstream using the excavated soil. Two layers of pineapple plants are to be planted on the bund with a spacing of 20 cm x 20 cm. Pineapple plants would stabilize the bund and provide additional income to the farmer. The runoff water from the upper side would



be collected in the trenches. Soil particles would also get collected in the trench along with the runoff water. Coconut husk retains the moisture and makes it available for plants during summer months

Half-moon bund around coconut basin reinforced with pineapple

This measure is to be taken up where there is mild slope (15-20%). Here a flat basin with a slight inward slope towards upstream is made by excavating soil from the upstream side and filling the excavated soil at the downstream side. After making the basin a bund of 30 cm height and >50 cm width is made at the downstream side of the coconut using the excavated soil. Two layers of pineapple plants would be planted with a spacing of 20 cm row to row and 20 cm plant to plant on the bund. The bund prevents runoff and water gets collected within the basin and percolates down. Pineapple would help to protect the bund and stabilize the same in addition to giving fruit yield.

Providing drainage

Proper drainage in the coconut garden is equally important as irrigation for better performance of coconut palms. Waterlogged conditions result in poor growth of palms. In ill drained garden, drainage facilities are to be provided during rainy season by digging deep and wide drains between the rows of palms and by raising the level of the ground around the individual palms.

Planting of perennials as mixed crops

Adoption of multiple cropping practices in coconut garden is suggested to ensure better utilization of basic resources and to enhance income and employment opportunities. After the palms attain a height of 5 to 6 metres (above 18 years) i.e., in older plantations, perennials like cocoa, pepper, cinnamon, clove and nutmeg can be grown as mixed crops. These crops can be planted at the onset of monsoon as per the details given below. These crops are to be adequately and separately manured in addition to the manures applied to the coconut palms. For facilitating multiple cropping in coconut gardens in the early growth phase itself it is advisable to have wider spacing of above 10 m x 10 m so as to provide ample opportunity to accommodate a number of perennial and annual crops in the interspaces.

Crops	Propa- gation	Planting pits	Spacing	No. of plants per ha
Cocoa	Grafts	75 x 75 x 75 cm	3m x 3m (Single hedge)	450
Pepper	Rooted cuttings	50 x 50 x 50 cm	7.5m x 7.5m (At the base of the palm)	175
Clove	Seed- lings	60 x 60 x 60 cm.	7.5m x 7.5m (At the centre of four palms)	148
Nutmeg	Grafts	60 x 60 x 60 cm	7.5m x 7.5m (Cen- tre of four palms)	148

Planting of suitable fodder grass species like Hybrid Bajra Napier (Co3) also can be taken up in coconut gardens at the onset of monsoon as part of coconut based mixed farming.

Field /crop sanitation measures

Decaying organic debris, dead coconut stumps, logs and other such organic materials from the coconut garden are to be removed as a measure of field sanitation to reduce incidence of pest/disease incidence before the monsoon sets in. Similarly, crown cleaning also has to be done before the rainy season.

Crop protection during rainy season

► Disease management

Diseases like bud rot and leaf rot affecting coconut are more prevalent during monsoon when the temperature is low and humidity is high. Hence, timely adoption of appropriate prophylactic/curative measures is very important to avoid spread of these diseases during rainy season.

► Bud rot

It is important to give prophylactic treatment to all palms in bud rot disease endemic areas at the onset of monsoon. In localities where bud rot is regularly observed crown cleaning of all palms should be taken up and 1% Bordeaux mixture sprayed as a prophylactic measure. Palms should be regularly observed and curative measures have to be adopted as and when the initial symptoms are seen. The earliest symptom is the yellowing of one or two younger leaves surrounding the spindle. The spindle withers and droops down. The tender leaf base and soft tissues of the crown rot into a slimy mass of decayed material emitting a foul smell. The disease kills the palm if not controlled at the early stages. In early stages of the disease, when the spindle leaf starts withering, cut and remove all affected tissues of



the crown and apply Bordeaux paste and protect it from rain by providing a polythene covering till normal shoot emerges. Burn all disease affected tissues removed from the palm. Field sanitation and providing adequate drainage in the coconut garden help to reduce the spread of the disease.

► Leaf rot

Leaf rot disease commonly occurs on coconut palms already affected by root (wilt) disease. Infection by this disease is the major reason for the low productivity of root (wilt) affected palms. As a prophylactic treatment against leaf rot disease mix 2 ml Hexaconazole 5 EC in 300 ml water and pour into the well around the base of the spindle leaf or apply talc based formulation of *Pseudomonas fluorescens* or *Bacillus subtilis* singly or in consortium @ 50 g in 500 ml/ palm at the onset of monsoon.

As the damage due to rhinoceros beetle infestation increases the chance of bud rot/leaf rot incidence, prophylactic leaf axil filling with 1:1 mixture of neem cake and sand @ 500g / palm before the onset of monsoon (May last week to June first week) is to be taken up on priority basis.

► Pest management

For the effective management of pests like rhinoceros beetle, red palm weevil, root grubs and eriophyid mite suitable prophylactic/curative measures are to be adopted in rainy season to avoid crop loss in coconut. Besides, close scrutiny and sustained monitoring in synergy with farm and palm hygiene is the key for success in pest suppression.

► Rhinoceros beetle and red palm weevil

For the management of rhinoceros beetle and red palm weevil infestation, prophylactic leaf axil filling with any of the following material before the onset of monsoon (May last week to June first week) is recommended.

- 1: 40 mixture of chloranthraniliprole granule (Fertera 0.4 % WG) and sand @ 250 g / palm (one round/year during May-June) or
- Leaf axil filling with 1:1 mixture of neem cake or

marroti or pongamia and sand @ 500g / palm or

- Leaf axil filling with naphthalene ball @ 12 g / palm and placing sand above it. (Repeat at 45 days interval)

As curative treatment in red palm weevil infested palms, spot application with indoxacarb (Avaunt 15.8 EC) @ 2.5ml / litre or imidacloprid (Confidor 200 SL, 17.8 ai) @ 1 ml/ litre is found effective in suppressing the pest as well as recovery of palms.

► Root grubs

For the control of root grub infestation in coconut, blanket application of bifenthrin @ 2 kg ai/ ha (i.e., Talstar 10 EC @ 20 litre / ha) is to be adopted during the last-phase of the South-West monsoon i.e., second week of August. Soil application of *Steinernema carpocapsae* @ 1.5 billion / ha during October is recommended for the bio-suppression of root grubs.

► Coconut eriophyid mite

In coconut palms with eriophyid mite incidence, spraying of neemazal (10000 ppm) @ 4 ml/ litre on young buttons after pollination or spraying of palm oil (20 %) sulphur (5%) emulsion during August is recommended.

Conclusion

Timely adoption of crop management practices especially soil health management and prophylactic/curative plant protection measures is very important to ensure sustainable coconut production. Diseases like bud rot and leaf rot affecting coconut are more prevalent during monsoon. Hence, timely adoption of prophylactic/curative measures is very important to avoid spread of these diseases during rainy season. Similarly, appropriate prophylactic/curative measures are to be adopted in rainy season for the effective management of pests like rhinoceros beetle, red palm weevil, root grubs and eriophyid mite to avoid crop loss in coconut. Adoption of integrated disease management practices by few individual farmers alone can not control the incidence of the fungal disease. Hence, efforts are to be made to facilitate group action among the coconut farmers at grass root level to get desired results for the adoption of IDM practices against bud rot in coconut. Hence, Farmer Producer Organisations like Coconut Producer Societies, Federations and companies can play important role in organising coconut farmers for effectively adopting prophylactic/curative plant protection measures and other crop management practices during rainy season. ■